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What to Expect in Dutch Elm Disease Management

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What to Expect in Dutch Elm Disease Management

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NOTE:
Many of the following guidelines and philosophies on Dutch elm disease (DED) management were obtained from the experiences of experts in Minnesota and Iowa. They have lived with DED for a longer time than South Dakotans. As one of the experts philosophizes, "Few, if any at all, win in Dutch elm disease management, but how you lose makes the difference."

What Has Occured in South Dakota

South Dakota's DED History

Dutch elm disease (DED), which is fatal to most elm trees, was first identified in Minnehaha County in 1967. By the summer of 1978, it had spread to 47 of 67 counties. See Figure 1.

DED is a fungus which, after entering the tree, plugs the water-conducting system; the tree dies because water cannot reach the crown.

The fungus spores are spread by elm bark beetles which breed in dead or dying elm wood. It can also be transmitted from one tree to another tree close by through root grafting (intergrown fused root systems).

The elm population in many South Dakota communities runs as high as 60% of the total tree population—high enough to justify a DED management program.

Action Taken

Communities have taken varying degrees of action. Some have implemented action programs undertaken by newly created City Forestry Departments financed by a special mill levy. Others have attempted to control the disease under existing financing and with presently employed personnel. Success has varied.

Implications of Different DED Management Programs

Communities With No DED Management Program

Records from states that have gone through the DED cycle show that in a 7-year period about 15% of the remaining elms died each year in a community with no DED program. This compares to a 1% loss in communities that have a high performance control program.

A no-control program was more costly to the community and its environment than where DED management was used, because of the rapid loss of the trees and the cost of replacing them. The total worth of real estate was also adversely affected. At the end of 12 years, only about 12% of the elms were still alive.

Communities With A Low Performance DED Management Program

Records show that states with a minimal program experienced about a 5% loss of elms each year over a 7-year span. This means it would take only about 11 years for the community to lose 25% of its elm trees.

Communities With A High Performance DED Management Program

Records favor the high performance control program. It keeps the loss of elms to about 1% per year, and in 25 years, about 75% of the elms still remain. During the interim, the removal and replacement program stays on an orderly schedule. The community doesn't suffer environmental and financial loss, and according to dollars and cents records it is less costly to the community, because the needed work can be done with existing or very little additional personnel.

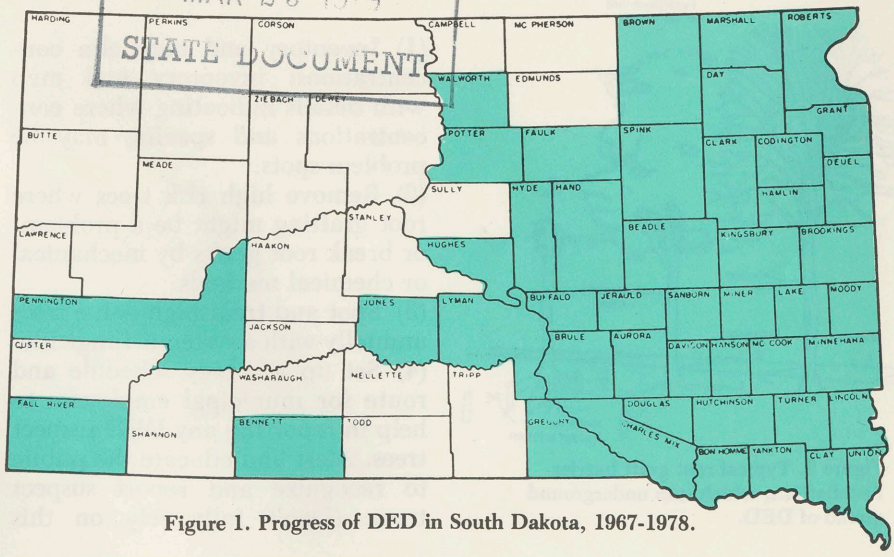

Figure 1. Progress of DED in South Dakota, 1967-1978.

What Is Involved

The No Control Program:

(1) No initial outlay of capital.
(2) Where communities had many elms, the real estate and environmental values deteriorate rapidly. There are risks to the public from the dead, standing trees; they become a public nuisance.
(3) Smaller communities are more inclined to follow this kind of program.
(4) Large communities following this program become involved in high cost removal and replacement.

The Low Performance Program:

(1) Some outlay of capital.
(a) The most hazardous dead elms are removed.
(b) A limited tree planting program is usually undertaken.
(2) The community's environment and real estate values are adversely affected. Dead trees eventually become a public nuisance.

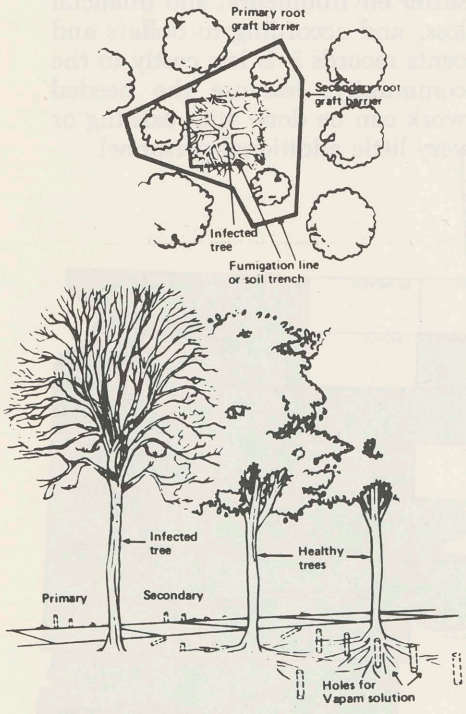

Figure 2. Typical root graft barrier installations, which stop underground spread of DED.

(3) The community usually isn't large enough to hire a trained expert. If action is taken, it usually involves a self-training program by some community-minded person(s).
(4) Unless residents can be convinced to voluntarily become involved in a sanitation, removal and replanting program, high costs for removal and replanting will follow.

The High Performance Program:

(1) Requires a comprehensive plan.
(2) Plans for financing the program through a mill levy are made.
(3) There are minimal losses in terms of environmental and real estate values.
(4) Large communities can adequately handle a program like this. If practical, they may even wish to share their expertise with smaller communities which cannot hire a full-time expert. Or, the smaller communities may wish to pool their resources and jointly undertake a DED management program.
(5) The cooperation of the total community is needed to effectively undertake this kind of program. An information and education program is a necessity.
(6) The community should expect a well-organized plan with an orderly schedule of sanitation, treatment, cultural practices, dead tree removal and a replanting program.

Actions to be Considered

(1) Inventory and map elm concentrations: inventory and map with details indicating where concentrations and spacing may be problem spots.
(2) Remove high risk trees where root grafting might be a problem, or break root grafts by mechanical or chemical methods.
(3) Spot and treat high value trees annually with a systemic fungicide.
(4) Set up a survey schedule and route for municipal employees to help in reporting any DED suspect trees. Alert and educate the public to recognize and report suspect trees. (Don't fully rely on this method.) Set up a survey schedule of your own.
(5) Consider using some idle land to start a tree bank. Plant a good mixture of small, inexpensive trees so they can be moved someday to replace elm trees that have been removed.

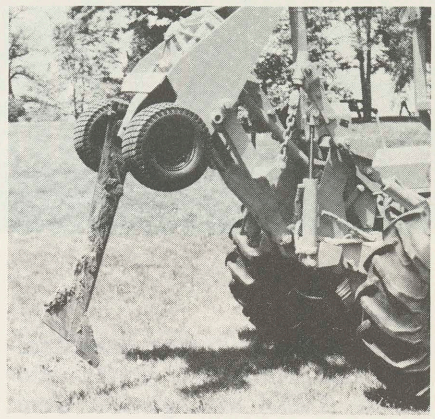

Figure 3. A vibratory plow disrupts root grafts between elm trees and can be operated two to three times faster than a soil trencher. It leaves no trench to be backfilled.

A Good Sanitation Program

Sanitation simply means cleaning up and removing potential breeding sites for the elm bark beetle. It includes **early detection** and **immediate removal** of diseased trees and **breaking the root grafts** with nearby elm trees. It also includes **removal and disposal of all weakened, dying and dead elm trees and branches** on a regular basis. All dead elm wood must be removed prior to April 1st.

A fireplace log 22 by 3 inches has a potential of producing up to 1800 beetles. If the log carries the disease, each of these beetles can carry the disease to nearby living trees. Removing and destroying dead elm wood prior to April 1st means that over-wintering beetles are also destroyed.

When trees become infected during the summer, attempt to remove them and destroy the wood before July 15th. Otherwise, another brood of beetles can be produced to carry the disease to nearby trees.

Proper and timely disposal is most important. Sometimes people become concerned about utilizing

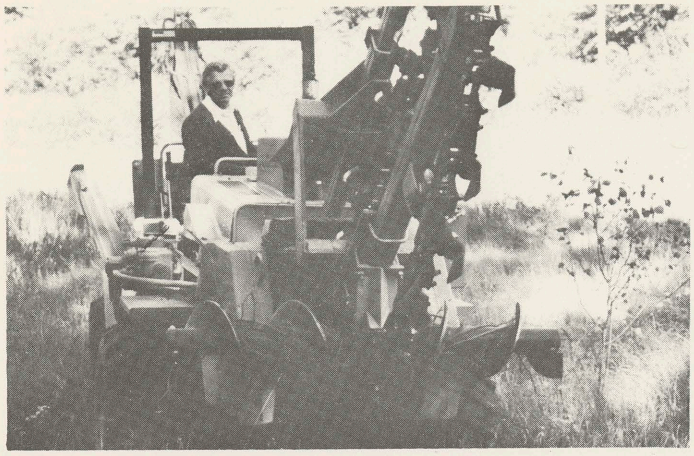

Figure 4. A soil trencher can be used to disrupt root grafts between elm trees. It leaves an open trench which must be backfilled.

the wood. In some communities, contractors will want to cut the wood and sell it for firewood. Make the contracts very strict. Limit the amount sold to individuals so it will be used up prior to April 1st, or sell elm firewood only after the bark has been removed.

Chipping the elm wood is a good alternative to burning and burying, since chipped wood cannot support beetle development. The chipped wood can be used for mulch or to cover and mark foot paths.

Limiting Spread by Breaking Root Grafts

Elm trees were easy to establish in South Dakota, because they were easily transplanted. Very often they were planted too close together. If one tree contracts the disease, the adjacent ones also become high risk because the disease can be transmitted through the intergrown fused root systems. Dense stands of elm trees or crowded boulevard trees automatically become high risk trees when DED moves into a community. Some cities' experiences show that root grafting caused over 70% of the annual number of trees that were infected.

If a tree in a boulevard becomes infected, break the root graft not only of the closest trees, but also break the grafts of the second nearest tree. In a dense stand, completely encircle the infected tree with root graft breakage methods and do likewise with adjacent trees as shown in Figure 2.

Consider removing weaker trees on boulevards where elms were planted less than 30 feet apart. In very crowded situations, remove every second tree and immediately replant with another suitable species. Removing trees will break most of the root grafts and give the replacement tree space to develop before DED runs its course. Check Extension FS 661 for recommended species.

Mechanically Breaking Root Grafts

The vibratory plow set to a 24 to 30 inch depth leaves less evidence of soil disturbance and can operate at fast speeds. However, rocky ground and

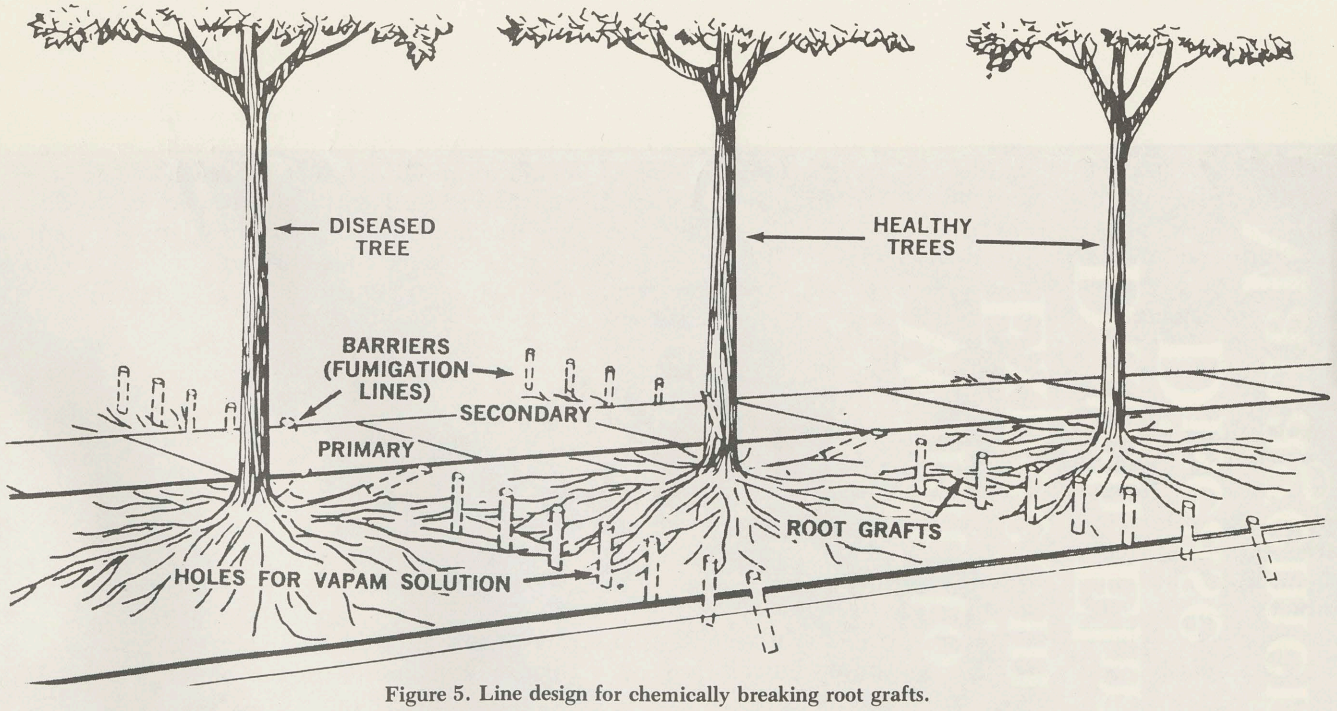

Figure 5. Line design for chemically breaking root grafts.

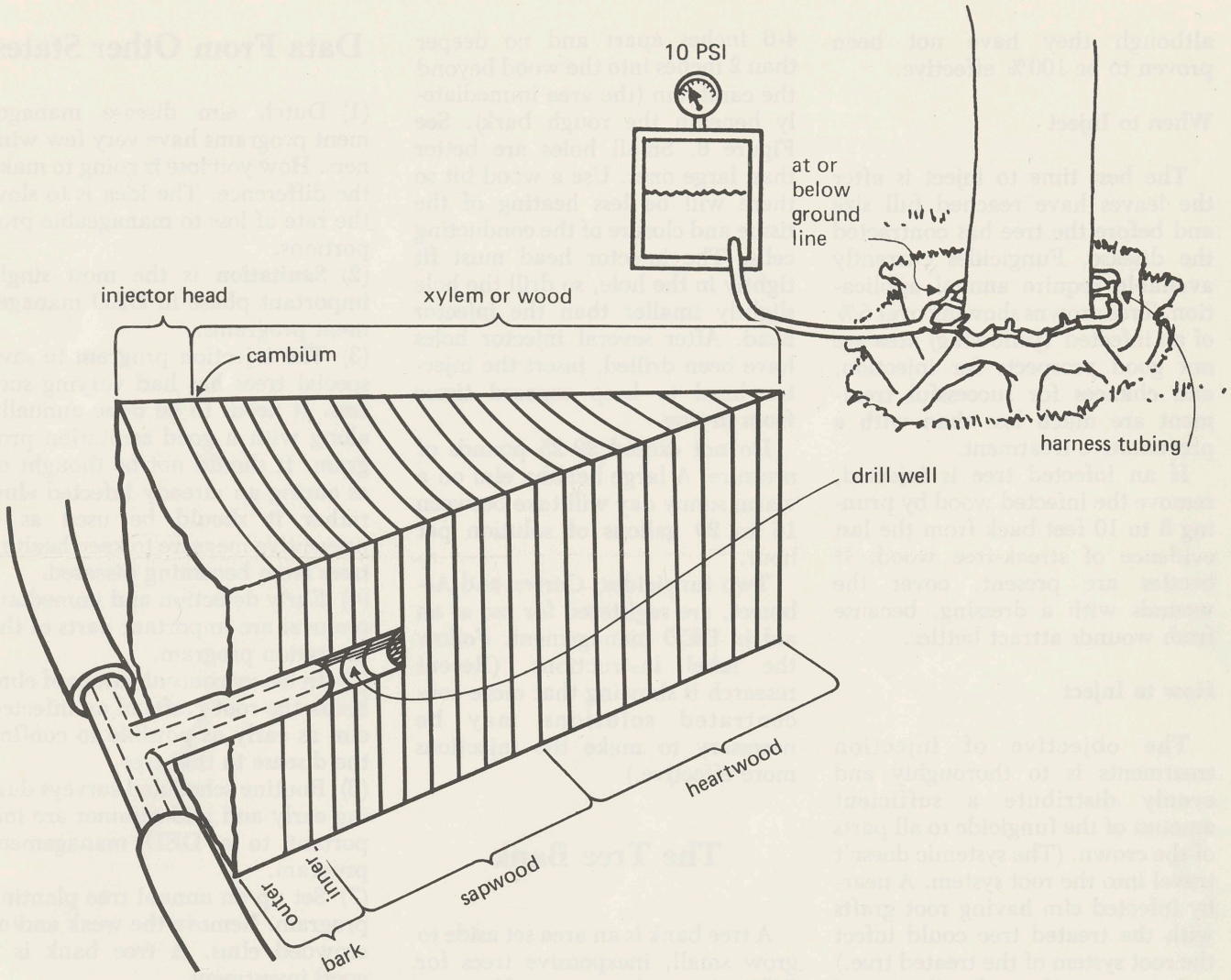

Figure 6. An elm showing placement of injection head for injection of a systemic fungicide.

underground cables can limit its performance. There will be no backfilling of an open trench. See Figure 3.

The soil trencher leaves an open trench to be backfilled. It operates slower than the vibratory plow. Rocks and underground cables limit its performance. However, trenching may be more dependable than chemical methods. See Figure 4.

Chemically Breaking Root Grafts

Sodium N-methyl-dithiocarbomate SMDC (Vapam) is the only soil fumigant registered for killing root grafts between trees. Though the chemical method has more disadvantages than advantages, it can be used where underground cables exist. See Figure 5.

Use the same line design as with mechanical methods. A series of holes 36 inches deep and 1 inch in diameter are drilled 4 to 6 inches apart. Mix one part SMDC in 4 parts of water and place 8 fluid ounces in each hole. Cover the hole immediately. Unlike the mechanical method, do not remove the infected tree for a 10-day period. This will insure time for the chemical to break the root graft. The biggest disadvantage is that the root grafts will not be sufficiently broken by the chemical to keep the disease in the infected tree's root system.

Intensive Pruning

If the disease is detected early enough and hasn't moved into the main trunk and roots, prune 8 to 10 feet back from the last evidence of streak-free wood. When the bark is pealed back, infected branches will show brown streaks. No streaks could mean DED hasn't yet reached that area. Periodically inspect the tree even into the next year for additional symptoms before considering the tree healthy.

Tree Injection

An intensive sanitation program is the key to managing DED. Injecting a systemic fungicide into the tree is an additional management aid, and it will be of more value when good sanitation procedures are used. People who wish to give special attention to valuable elm trees may choose to use one of the available water soluble fungicides,

although they have not been proven to be 100% effective.

When to Inject

The best time to inject is after the leaves have reached full size and before the tree has contracted the disease. Fungicides currently available require annual application. Tree crowns showing over 5% of an infected (yellowing) area are not good prospects for injection, and chances for successful treatment are much less than with a preventative treatment.

If an infected tree is injected, remove the infected wood by pruning 8 to 10 feet back from the last evidence of streak-free wood. If beetles are present, cover the wounds with a dressing, because fresh wounds attract bettles.

How to Inject

The objective of injection treatments is to thoroughly and evenly distribute a sufficient amount of the fungicide to all parts of the crown. (The systemic doesn't travel into the root system. A nearby infected elm having root grafts with the treated tree could infect the root system of the treated tree.)

A more uniform distribution of fungicide is attained when the injection holes are drilled at ground level or below — preferably in the root flares. Dig up the soil around the base of the tree if necessary.

For inserting the injector head, use a 5/16" bit to drill holes about 4-6 inches apart and no deeper than 2 inches into the wood beyond the cambium (the area immediately beneath the rough bark). See Figure 6. Small holes are better than large ones. Use a wood bit so there will be less heating of the tissue and closure of the conducting cells. The injector head must fit tightly in the hole, so drill the hole slightly smaller than the injector head. After several injector holes have been drilled, insert the injector head to keep exposed tissue from drying.

Do not exceed 20-25 pounds of pressure. A large healthy elm on a warm sunny day will take between 16 to 20 gallons of solution per hour.

Two fungicides, Correx and Arbotect, are registered for use as an aid in DED management. Follow the label instructions. (Recent research is showing that more concentrated solutions may be necessary to make the injections more effective.)

The Tree Bank

A tree bank is an area set aside to grow small, inexpensive trees for DED elm replacements. If a tree bank is started in 1979, 5 to 10 years later a community will have a source of "large trees" to replace the disappearing elm population. The transition will not be as noticeable environmentally and financially.

Data From Other States

(1) Dutch elm disease management programs have very few winners. How you lose is going to make the difference. The idea is to slow the rate of loss to manageable proportions.
(2) **Sanitation** is the most single important phase in DED management programs.
(3) The injection program to save special trees has had varying success. It needs to be done annually along with a good sanitation program. It should not be thought of as curing an already infected elm; rather it should be used as a preventive measure to keep healthy trees from becoming diseased.
(4) Early detection and immediate removal are important parts of the sanitation program.
(5) In heavy concentrations of elm, break the root grafts of an infected elm as early as possible to confine the disease to that tree.
(6) Routine scheduled surveys during early and mid-summer are important to a DED management program.
(7) Set up an annual tree planting program. Remove the weak and/or crowded elms. A tree bank is a good investment.
(8) Involve and educate the public as much as possible.

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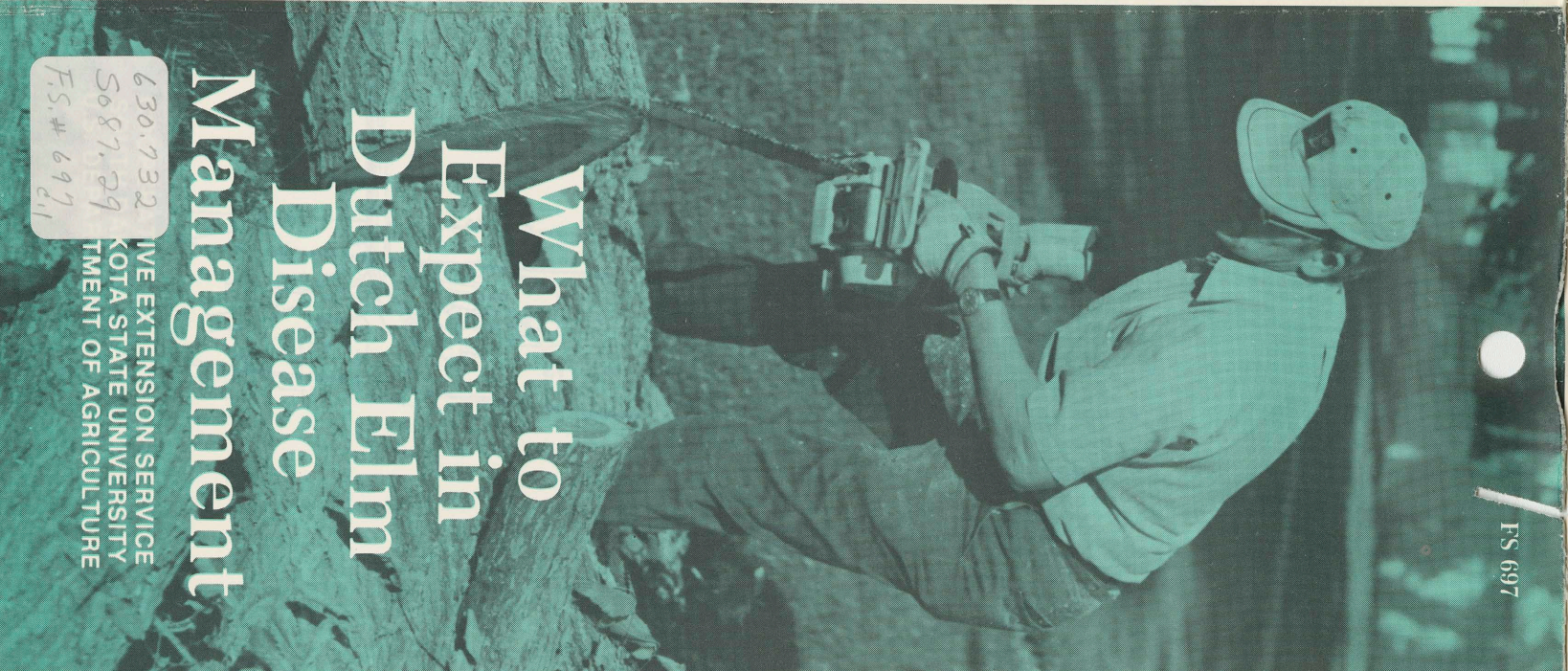

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